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THE Chemist

DECEMBER, 1946 VOLUME XXIII, No. 12

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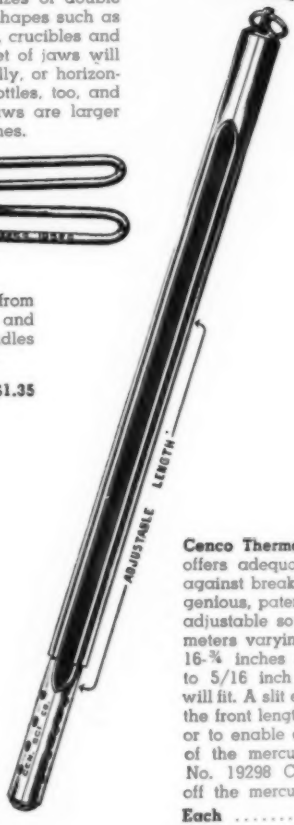

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The Chemist

Publication of

THE AMERICAN INSTITUTE OF CHEMISTS, INC.

60 East 42nd Street, New York 17, N. Y.

Volume XXIII December, 1946 Number 12

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Entered as second class matter April 8, 1936, at the Post Office at New York, N. Y., under Act of August 24, 1912. Issued monthly at 60 East 42nd Street, New York 17, N. Y. Subscription price, $2.00 a year. Single copy, this issue $0.25.

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CHEMICALS INDISPENSABLE TO INDUSTRY AND AGRICULTURE

Fundamentals of Legal Registration and National Certification

E. L. Luaces, F.A.I.C.

Chairman, Public Affairs Subcommittee
Ohio Chemists' Committee on Professional Practice

ALL too frequently we are asked: What's this "national certification" I hear about? Does it mean that I can get myself a certificate good all over the country? Is this the same as being registered in a single state, but on a national scale?

These questions, or their equivalent, are asked so often that it is obvious that the chemist is confused. Yet, the distinction is clear and unequivocal:

a. Legal registration is granted by a State Board established for the purpose of determining whether an individual meets certain minima in character, technical education, and practical experience, and certifying that the individual does meet such minimum requirements by granting a certificate of registration. Such a certificate is *prima facie* evidence of competence, and carries the weight of law.

b. National certification entails meeting the requirements set up by a private organization, according to rules of its own making, and receiving from such body a certificate. Such certificate would have no legal status and would carry no weight at law.

The proposed Chemists Registration Act of Ohio is a typical example of legal registration.

Legal registration is the certification by a legally established board of the character, professional competence, technical training, and practical experience of the registrant. It differs from "National Certification" in that in the latter the certifying body is privately controlled and has no standing at law, while the former carries the legal recognition which is part and parcel of a State-established certifying body, the State Board of Registration.

By way of explanation for the benefit of those who may not be acquainted with the facts, it is well to point out that the proposed Chemists Registration Act of Ohio is sponsored by the Ohio Chemists' Committee on Professional Practice (Ohio C_2P_2), the membership of

which consists of the following:

American Chemical Society: Akron, Cincinnati, Cleveland, Columbus, Dayton, Northeastern Ohio, Toledo, and Wooster Sections.

American Electroplaters' Society: Columbus and Dayton Branches.

American Institute of Chemists: Miami Valley and Northern Ohio Chapters.

Alpha Chi Sigma: Akron, Cleveland, and Dayton Groups.

Ohio Academy of Science: Chemistry Section.

The Committee limits its activities, in accordance with its charter as a corporation of Ohio not for profit, to promoting a wider acceptance of chemists as professional men in the state of Ohio, and a broader participation by the individual members of its member societies in civic, educational, and similar activities in which chemists can render service to the community.

The Committee's sponsorship of the proposed Chemists Registration Act of Ohio fulfills a mandate given by the chemists of Ohio by secret ballot, in which eighty-two per cent voted in favor of a State Registration Act for chemists. Other interesing results of the balloting were the following:

a. Ninety-eight per cent thought they *should be* considered professional men, but only fifty-five per cent felt that the public considered them, and employers treated them, as professional men.

b. Ninety-seven per cent favored minimum requirements for the right to the title of chemist, and eighty-three per cent believed the A.C.S. should report favorably on *State Registration* for chemists.

The Registration Act sponsored by the Ohio C_2P_2 in behalf of the chemists of Ohio, whom it represents, is *permissive* in nature, and only that small group of chemists whose work is of such nature that it directly affects the health, safety, and welfare of the public would be required to register and be certified by the State Board of Registration as possessing the established *minimum* qualifications for the protection of life, health, and property.

Essentially, under the proposed law, the following situation would exist:

1. Every chemist *in responsible charge of operations* affecting the public health, safety, and welfare (public analysts, consultants, clinical pathologists serving the public, water and sewage works operators, milk inspectors, and the like) would be required to establish his competence to carry on such work by meet-

ing the minimum requirements of the State Board of Registration.

2. Any chemist working in the fields set forth in (1) above as a subordinate or under the direction and responsible supervision of a Registered Chemist, would have the right to apply for registration and thereby establish his competence legally, but would not be required to do so.

3. A chemist employed by a manufacturer would not be required to register, but may register if he so desires.

4. Chemical engineers who hold registration as Professional Engineers in Ohio, would *not* be required to re-register as chemists, since they already enjoy the legal right to practice chemistry.

It will be seen, therefore, that under the proposed Chemists Registration Act of Ohio, only a small number of chemists engaged in phases of chemistry which have a direct bearing on public safety and public health would be *required* to register with the State Board of Registration and thus establish their competence to perform such work. However, this will not prevent other chemists from seeking such registration if they so desire, thereby legally establishing their competence to practice in such fields.

Thus it results that the proposed Chemists Registration Act of Ohio does not compel any chemist to seek registration unless he is engaged in these limited fields of activity wherein the police powers of the State may be invoked to protect life, health, and property.

Now, by way of comparison, how would National Certification work?

It is proposed that there be established a "National Board of Chemical Examiners". This board would be a private entity, responsible to none but itself. This board would accept applications for certification from applicants who represent themselves as chemists, would review their qualifications, subject them to examination to prove their competence, and issue a certificate upon satisfactory meeting of the requirements set up by the board.

In other words, the proposed National Board of Chemical Examiners would do substantially the same thing as the State Registration Board under the Chemists Registration Act of Ohio, with these important exceptions:

a. The National Board's decisions could not be reviewed at law, and one whose rights have been infringed would have no redress.

b. The certificate of the Nation-

al Board would have no standing at law.

c. The National Board would have no power to compel those whose work affects the public health or the public safety to prove their competence, nor could it prevent malpractice.

Essentially, therefore, the National Board of Chemical Examiners would be utterly impotent, their certificate would have no value or standing at law, and those injured by actions of the board would have no redress. In contra-distinction, the acts of the State Registration Board provided for in the proposed Chemists Registration Act of Ohio would be reviewable at law, thus giving the registrant legal means for protecting his rights; the certificate of registration issued by it would be *prima facie* evidence at law of the competence of the registrant; and the State Board would have the right to exclude the incompetent from chemical practice.

The proponents of National Certification point with pride to the success of similar private bodies in other professions; for example, the National Board of Medical Examiners and the National Bureau of Engineering Registration. However, they fail to understand that these bodies operate in fields in which State registration is universally required, and that they serve solely to establish the competence for the individual either in a special branch (as in medicine) *after* the individual has been certified by a State Medical Board as competent for general practice; or serve solely as an authenticating agency for the record of the applicant (as in engineering) either prior to or after State certification has been secured. In engineering, for example, although there are some 90,000 registered engineers in the country, *less than two-hundred* have considered National Certification sufficiently valuable to seek it. In fact, the examinations of the National Bureau of Engineering Registration are not given by that body, but by the State Board in the State wherein the applicant resides!

For those who wish "National Certification" as chemists the machinery already exists and has existed for more than twenty-three years. THE AMERICAN INSTITUTE OF CHEMISTS classifies its members according to educational level and practical experience into three classes: Fellows, Members, and Associates. The standing of the organization cannot be questioned since men such as Walter J. Murphy, Gustav Egloff, Foster Dee Snell, Harry N. Holmes, James R. Withrow, Willard H. Dow, A. Cressy Morrison, L. W. Bass, Charles Allen Thomas, Frank R. Curtis, C. F. Burgess, Wallace P. Cohoe, William D. Coolidge, M. L. Crossley, E. A. Doisy, Gustavus J. Esselen, William M. Grosvenor, William D. Harkins,

Martin H. Ittner, Donald B. Keyes, Walter S. Landis, Alexander Silverman, and Maximilian Toch, and many other chemists of note and accomplishment have been identified with it over many years.

It is submitted that there is no need for the proposed National Board of Chemical Examiners; that it would be impotent and of no standing at law; and that every task intended to be entrusted to it can be carried out with equal satisfaction by THE AMERICAN INSTITUTE OF CHEMISTS, already organized and active for more than twenty-three years.

It is further submitted that State Registration, as provided for by the proposed Chemists Registration Act of Ohio does not impose a burden on the chemists of Ohio, for whom it is intended; that it will aid in establishing on a legal basis their standing as professional men; and that it will make it possible to police effectively the profession to prevent the unskilled and the incompetent from endangering public health, public safety, and public property.

Nobel Prize Awards

The Nobel Physics Prize and Chemistry Prize Committees at Stockholm, Sweden, awarded these prizes on November 14th to Americans. Dr. Percy Williams Bridgman, Hollis professor of mathematics and natural philosophy at Harvard University, received the Nobel prize in physics for his invention of high-pressure apparatus and his studies "within the sphere of high-pressure physics."

One-half of the chemistry prize was given to Dr. James B. Sumner, professor at Cornell University, for his "discovery that enzymes may be crystallized." The other half of the prize was shared between Dr. John H. Northrop and Dr. Wendell M. Stanley, both of Rockefeller Institute for Medical Research, Princeton, New Jersey, for their "achievements in preparing enzymes and virus proteins in pure form".

The second National Plastics Exposition will be held at the Coliseum, Chicago, May 5-11, 1947, under the auspices of the Society of the Plastics Industry, which will hold its annual convention concurrently at the Stevens Hotel, Chicago.

Dr. Gustav Egloff's speaking engagements include an address, on December 6th, before the Milwaukee, Wisconsin, Section of the Society of Automotive Engineers on "Modern Motor Fuels"; a talk on December 9th, before the Chamber of Commerce of South Bend, Indiana, on "New Things for More People"; and an address, on December 11th, before The Swedish Engineers' Society, Chicago, on "China's Mineral Potentialities and My Experiences There."

Turner With Rowse Company

Wendell P. Turner, Jr., M.A.I.C., is now technologist and production manager of the Rowse Company of Sommerville, Massachusetts, and Greenville, New Hampshire. His new address is 633 Lynn Fells Parkway, Melrose, Massachusetts.

Lythgoe Retires

Herman C. Lythgoe, F.A.I.C., is retiring as director of the Food and Drug Division of the Massachusetts State Public Health Department, which he has served for nearly fifty years.

Industry Urged to Award More Fellowships

Dr. James R. Killian, Jr., vice president of Massachusetts Institute of Technology, urges an increase in industry's assistance to higher education through more scholarships and fellowships to assist in overcoming shortages in the supply of scientists.

In an article in *The Lamp*, publication of Standard Oil Company (New Jersey), Dr. Killian declared, "we simply haven't the scientists needed to take full advantage of our multiplying opportunities in this world of accelerating technological change." The United States is the only country to stop nearly all scientific education during the war, and as a result, Dr. Killian emphasized, 150,000 scientific students who would have been awarded bachelors' degrees did not receive them. "The replenishment of our national reservoir of men with advanced training will accordingly be slower than that of men on the bachelor level". By 1955 a deficit of about 3,600 doctoral degrees in chemistry is forseen. An increase of industrial fellowships, now, would attract more graduate students of exceptional ability. The normal flow of college graduates is expected to resume sometime in the 1950's.

Dinsmore Elected Trustee Midwest Research Institute

Dr. R. P. Dinsmore, F.A.I.C., vice president in charge of research and development for Goodyear Tire and Rubber Company, has been elected a trustee of the Midwest Research Institute, Kansas City, Missouri. The Midwest Research Institute is made up of an impartial body organized for the purpose of aiding industry and agriculture by helping small manufacturers, business men, and farmers in scientific research. It serves the mid-western area including Missouri, Nebraska, Iowa, Kansas, Arkansas, and Oklahoma.

Dr. R. W. Truesdail, F.A.I.C., president of Truesdail Laboratories, Inc., Los Angeles, California, recently purchased an Ercoupe plane which he, himself, flies in transacting business for the laboratory. He finds the plane an excellent means of conquering the vast expanses of the West. "Every modern research laboratory should have one," he claims.

The Role of the Federal Government in Postwar Scientific Activities

John T. Connor

Presented before the Legislative Section of the National Drug Manufacturer's Association, Virginia Beach, May sixth, and revised as of October 30th for THE CHEMIST *by the author.*

Mr. Connor, special assistant to the Secretary of the Navy became familiar with the problems presented by government scientific activities while general counsel of the Office of Scientific Research and Development and counsel of the Office of Research and Inventions (now Office of Naval Research) Navy Department. In this paper he expresses his personal views, accumulated as a result of work for the Government as a lawyer over a period of several years, and he is not attempting to express the official views either of the Navy Department or of the OSRD.

IT was not until World War II that the Federal Government supported scientific activities to the extent of millions of dollars, but some support has been accorded to science almost from the inception of the Government. During the 19th century, there were created within the Government scientific and technical agencies, such as the Coast and Geodetic Survey, the Naval Observatory, various Bureaus of the Department of Agriculture and the Geological Survey, later followed by the Smithsonian Institution, the Bureau of Mines, the Bureau of Standards, the National Institute of Health, the Naval Research Laboratory, and the National Advisory Committee for Aeronautics, and other similar organizations. But the work of many of those organizations was hampered by inadequate funds; some of the scientific agencies had serious personnel problems arising out of the application of civil service and classification rules and procedures; and most were troubled by the use of fiscal and budgetary procedures that entwined scientific and technical work in the same "red tape" intended for more routine governmental administrative activities.

In the field of national defense, particularly, the Government neglected even the most fundamental scientific activities, resulting in a situation recently summarized by Rear Admiral Harold Bowen, the Chief

of Research and Inventions of the Navy Department, in a statement that at the beginning of World War II "our own weapons as well as those of our Allies were in general similar to those used in World War I", whereas our enemies "had devoted almost the entire energies of their research and development facilities to the perfection of new and more effective implements of warfare."

It was not until June, 1940, that the first steps were taken to remedy the dangerous situation into which we had fallen in scientific activities related to the national defense. Then the Council of National Defense, previously organized by President Roosevelt from among his Cabinet, established the National Defense Research Committee with Dr. Vannevar Bush as chairman, and Drs. Conant of Harvard, Compton of Massachusetts Institute of Technology, Jewett of Bell Telephone Laboratories, and Tolman of California Institute of Technology, the Commissioner of Patents, Mr. Conway Coe, and one Army and one Navy representative as members. NDRC was concerned only with research and development in connection with weapons and instrumentalities of warfare, and on June 28, 1941, the Office of Scientific Research and Development (OSRD) was established by executive order in order to add support of medical research activities. Thereafter NDRC and the Committee on Medical Research (CMR) were the main operating arms of OSRD, and it was through those committees that Dr. Bush, who became Director of OSRD, received the advisory and administrative assistance needed to carry out the functions of OSRD.

Five important policy decisions were made in the early days of NDRC and OSRD which have been cited as responsible for the success of those organizations. First, there was unanimity of opinion both among the civilian and military representatives that the new organization should be independent of the War and Navy Departments, although it was recognized that close working relationships with the Armed Services at all levels were essential. Second, there was an equally strong feeling that the new organization should not attempt to establish or operate any governmental laboratories, but should spend its appropriated funds by means of contractual arrangements with existing research organizations, particularly non-governmental organizations such as universities and commercial organizations. Third, it was agreed that the success of the new organization depended to a great extent upon the type of personnel brought in to administer its affairs. The decision was made, therefore, to utilize as much as possible the advice and services of experts who were not in a position to accept employment on the

Government payroll, but who, nevertheless, were willing to serve the Government in this work for as much time as could be spared from their private activities. The fourth major decision was to decentralize the activities as much as possible by establishing divisions staffed with the most competent available personnel and by delegating enough authority to make them quite autonomous within their assigned fields. And lastly, there was an intense conviction that OSRD should "stick to its knitting" and not try to expand its activities beyond the assigned scope of war weapons and medical research.

You are all generally familiar with the results achieved by the universities and commercial firms working under OSRD contracts. Of course, great strides were also taken by the War and Navy Departments, the National Advisory Committee for Aeronautics, by the Office of Production Research and Development within the War Production Board, and by other governmental agencies and private organizations working within their special fields independently of OSRD. The total of all the advances during the war has moved us into a new era whose potentialities are difficult to comprehend.

Present Situation

Discussion of the role of the Federal Government in post war scientific activities must be preceded by a consideration of the factual situation existing today in this war-ridden world. On the international scene, we see the United Nations banded together in an association that is now attempting to deal with problems that are almost insoluble. The inadequacy of the type of organization established by the United Nations is becoming painfully apparent, and there is a growing demand for the establishment of a world organization that will have real authority to investigate, consider, and decide questions upon which the peace of the world depends.

Probably the most important of such problems involves the development and control of atomic energy. The initial informed public discussion of the international aspects of that problem is found in the refreshingly frank "Report on the International Control of Atomic Energy"[1] prepared for and unanimously approved by the Secretary of State's Committee on Atomic Energy, composed of Mr. Dean Acheson, chairman, and Drs. Vannevar Bush and James B. Conant, General Leslie Groves and Mr. John J. McCloy. The report was prepared by a Board of five expert consultants of which Mr. David E. Lilienthal was chairman and Drs. J. Robert Oppenheimer and Charles A. Thomas, and Messrs. Chester Barnard and Harry Winne

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[1]That report became the basis for the plan later submitted to the United Nations Atomic Energy Committee by the United States member, Mr. Bernard Baruch.

were members. Thus, the Committee and the Board were composed of men thoroughly conversant with the broad scientific, political, social, and economic problems involved.

The inadequacy of the present United Nations organization is spotlighted by the Board's recommendations specifying activities that should be assumed by a world organization in order to achieve effective international control of atomic energy. At the moment it is difficult to grasp the far-reaching effects in the field of international and national politics if the United Nations control and administer, as is proposed in the Report, (1) the prospecting for, mining and refining of uranium and thorium, (2) the manufacturing processes and operations whereby the isotope 235 is enriched, (3) the operation of various types of reactors for making plutonium, and of separation plants for extracting plutonium, and (4) research and development in atomic explosives.

Consideration of the future scientific activities of the Federal Government must also be viewed in light of our present situation. Although our country was spared the dreadful physical devastation of war, its less apparent effects will be the source of trouble within our borders for many years to come, and probably will result in an intensification of the head-on conflicts of interest and general uncertainty and confusion that characterizes the present domestic scene.

Of prime significance is the natural tendency of individuals and organizations to attempt to cast off all governmental restraints and "return to normalcy" as quickly as possible. During the war, all of us were subjected to many types of controls to which we were unaccustomed and which we resented, such as military service, security regulations, OPA and WPB regulations, travel restrictions, etc. Now that the actual fighting has stopped, it is to be expected that there would be an immediate swing to the other extreme, and thus we are going through a period of widespread denunciation of and disassociation from nearly everything connected with the military and other branches of the Federal Government.

If those domestic conditions are to last for any appreciable period, it would be a waste of time to discuss Federal post war scientific activities because they would shrink to pre-war proportions and could be lightly regarded by most American commercial organizations. As a matter of fact, however, it seems probable that the importance and the urgency of the problems to be faced on a national and international level will be recognized in their true perspective before many more months, and at that time there should be more sympathetic and active cooperation from us, as individuals and as organizations, with those persons who will be so unfor-

tunate as to hold responsible positions within the Federal Government.

Most of the problems which will have to be faced eventually are already before us in legislative proposals. In the scientific field the most important bills now under consideration are concerned with the domestic control of atomic energy and the establishment of a National Science Foundation. In addition, however, countless other bills dealing with narrower scientific problems have been put "in the hopper".

Atomic Energy Legislation

Because of its importance and urgency, the pending atomic energy legislation has received more newspaper space and public discussion than any other in the scientific field. Unfortunately, most of the discussion has revolved around the completely "phony" issue of military control versus civilian control, with the result that the really important issues are being decided in the Congress without the benefit of adequate public discussion and comment. I characterize that issue as "phony" because it is an attempt to force an open door; at no time during the discussion did the War Department, the Navy Department or any other responsible military or civilian authority advocate that the organization to be set up to encourage and control the domestic phases of atomic energy be under the voting or other *control* of the military. Undoubtedly the May-Johnson bill (reported out of the House Military Affairs Committee as H. R. 4566) had too stringent security provisions, and a mistake was made in terminating the hearings on the bill before the views of many more interested individuals and groups had been heard. Thus, the appointment of the Senate Special Committee on Atomic Energy was a desirable move, and the hearings held by that Committee brought forth a discussion of many relevant points not theretofore discussed.

In their later stages the Senate Special Committee hearings were concerned primarily with the provisions of S.1717, introduced by Senator McMahon, and an amended version of that bill was reported out to the Senate on April 19, 1946.[2] In its amended form S. 1717 constitutes an almost revolutionary piece of legislation, and it merits careful study and consideration. The Atomic Energy Commission to be established thereunder is given broader powers and duties, both of a regulatory and operating nature, than have ever before been accorded to any agency in the Federal Government. That Commission will own and operate, or contract for or license the operation of, billions of dollars worth of mining, production and manufacturing facilities; it will

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[2]As further amended by the House of Representatives and in conference, S. 1717 became law on August 1, 1946 as the "Atomic Energy Act of 1946".

control by means of licenses all activities requiring the use of certain materials necessary for the performance of work in the field of atomic energy; it will operate Government laboratories and other research and development facilities, and will contract with governmental and nongovernmental organizations for the performance of research and development work; it will be given broad powers of control over the dissemination of information in the field; and it will administer what would be our first compulsory patent licensing system, will receive title to countless patents and inventions of great importance, and will have the power of confiscation over a broad area of inventions and patents.

The grant of such sweeping powers to a governmental agency probably is essential in this case. For one thing, the potential military uses of atomic energy are so important to the security of citizens of the United States that our Government must be in a position to control all aspects of the problem until the other major nations are willing to enter into effective international arrangements which would give us some assurance that knowledge interchanged with them would not be used for our destruction. Second, although private financing of the development of certain aspects of atomic energy may be expected within the next few years, it now appears that financing by the Federal Government will be required for most phases of development because of the present lack of reasonable commercial incentive. Furthermore, it would seem to be in the public interest for the Government to embark upon a comprehensive and integrated program for the development of peacetime uses of atomic energy, rather than depend upon piecemeal time-consuming efforts.

National Science Foundation Legislation

Congress is literally deluged with bills introduced to provide federal financial support for scientific activities, especially research and development activities in the fundamental sciences, medical sciences and the field of national defense. Until those legislative proposals advance further, it is impossible to predict accurately the nature of the activities of the Government in those fields, but the general support of some of the pending bills indicates that the Federal Government is about to embark upon a broad program for the support of scientific activities.

Recognizing that such problems would arise with the end of hostilities, on November 17, 1944, President Roosevelt addressed a letter to Dr. Vannevar Bush, OSRD Director, requesting recommendations as to how the information, techniques and research experience developed by OSRD and by the thousands of scientists in universities and in private industry

during the war should be used in days of peace for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living. Dr. Bush appointed special committees composed of distiguished scientists and other citizens and assigned to them for consideration and recommendations specific questions asked by President Roosevelt. These committees studied the problems at some length and reported their results to Dr. Bush, who, on July 5, 1945, submitted his report to President Truman entitled "Science, the Endless Frontier". The recommendations contained in the Bush report became the basis for a bill (S. 1285) introduced by Senator Magnuson to provide for the establishment of a National Research Foundation as an independent agency of the Government.[3] A somewhat similar bill (S. 1297) was introduced by Senator Kilgore, but the Kilgore bill differed from the Magnuson bill chiefly in its proposals for (1) a different type of administrative organization, and (11) changes in respect to the handling of inventions and patents by *all* Government agencies.

Extensive hearings on the Magnuson and Kilgore bills were held by Subcommittees of the Senate Committee on Military Affairs and Commerce, and thereafter joint studies continued with a view to reconciling the difference between the bills. Finally as a result of those hearings and discussions a compromise bill (S. 1850) was introduced on February 21, 1946. Shortly thereafter S. 1850, the Kilgore-Magnuson bill, was favorable reported out by the Subcommittees to the full Committees on Military Affairs and Commerce. The Senate Committee on Military Affairs subsequently (on April 9, 1946) reported the Kilgore-Magnuson bill to the Senate without amendment, and the bill was scheduled for debate in the Senate early in May.[4]

The provisions of the Kilgore-Magnuson bill that aroused the most controversy were (1) the inclusion of the Division of Social Sciences, to which objection is made on the ground that, because of the difference in

[3] At the same sime (July 19, 1945) a bill identical to the Magnuson bill was introduced in the House of Representatives by Representative Mills of Arkansas. The Mills Bill with some minor amendments was reintroduced as H. R. 6448 in May, 1946, and was reported out after hearings by the Subcommittee on Public Health to the Interstate and Foreign Commerce Committee on July 19, 1946. Because of the imminent adjournment of Congress, the Committee decided on that date to defer action on the legislation until the new Congress reconvened.

[4] S. 1850 passed the Senate on July 3, 1946, after a two day debate during the course of which the support of social sciences was eliminated. Lack of time prevented House action before adjournment. The President, however, recently attempted to fill the gap partially by issuing Executive Order 9791, dated October 17, 1946, under which broad coordinating powers in the field of federal research and development have been given to the Director of War Mobilization and Reconversion.

techniques and problems, its activities are apt to bring the entire Foundation into political, social, and economic disputes that may hamper its work, and (2) the patent provisions, to which exception was taken on the grounds that (I) the provisions should be limited to the work of the Foundation and should not attempt to revise so drastically the patent procedures and policies of all Government agencies, (II) in substance the provisions fail to give adequate consideration to rights of organizations with which the Government contracts, (III) the question of foreign patents covering inventions arising out of federally financed research and development work is covered neither intelligently nor adequately, and (IV) the complexity and detail of the administrative requirements imposed upon Governmental agencies in negotiating patent rights will slow down and unnecessarily interfere with the work of such agencies.

Basic Science

The Bush report and the hearings before the Senate Subcommittees have clearly shown the great need for support by the Federal Government of the basic scientific research work ordinarily performed in universities. The Bush report concluded with respect to this point that new impetus must be given to the discovery of fundamental knowledge and that such new impetus can come promptly only from the Government. Commercial organizations may be depended upon to carry the burden of research in the applied fields because of the reasonable close connection of such work to their financial interests, but the basic sciences will suffer unless financial support from the Federal Government is forthcoming in the near future. Viewed solely as a business proposition, such support would be a good investment because it would enable the accumulation of new knowledge which would be made available for use by all commercial organizations in the commercial fields.

Medical Research

There is also widespread approval of the proposal for financial support by the Federal Government of medical research work. The experience during the war has pointed up the inadequacies of the present system, if it can be called such, under which medical research workers are trained and under which medical research work is conducted. It has become clear that the health of the nation and of the world depends upon an increased emphasis in this field, and few objections have been voiced against the proposal to supply federal funds to support some such activities, at least if the furnishing of such funds is not accompanied by attempts to control the academic freedom that has been achieved to a great extent in our country.

The idea of providing federal financial support for medical research

work is so appealing, however, that there is danger that effectiveness will be lost through the adoption of too many uncoordinated proposals. While the Kilgore-Magnuson bill provided a vehicle for the adoption for a broad and comprehensive program in this field, there are many other legislative proposals designed to attack the problems piecemeal.

Worthwhile and noble as are the objectives of such legislation, they fail to take into consideration the limited number of trained medical research workers available in this country at the present time. With all the pressure during the war for the conduct of medical research work of such great importance to the success of our troops, the Committee on Medical Research of the OSRD was never able to recommend the expenditure of over $6,000,000 in any one year. Such being the situation, it would be foolhardy and wasteful for the Government to establish and finance programs for medical research which inevitably would compete with each other for the services of the limited number of trained personnel. It would seem far wiser and more economical to pass legislation such as embodied in the National Science Foundation legislation under which the money and personal service available could be used in a well-coordinated and balanced program.

National Defense

The other "glamour field" receiving attention at the present time is research and development work related to national defense. Nearly everyone who came in contact with such activities during the war has a firm conviction that never again should scientific and technical activities in the field of national defense be allowed to be neglected as they were between World War I and World War II. This has resulted in many proposals for the improvement of scientific activities within the Armed Services, for the improvement of coordination of research and development of joint interest to the War and Navy Departments, and for the establishment of organizations to insure that the Army and Navy continue to receive the benefit of scientific activities conducted in university and commercial laboratories.

To improve the conduct of research and development activities within the War and Navy Department, both Departments are now working out plans for the coordination of such activities among their own bureaus and services to an extent heretofore unknown. The Navy Department has established the Office of Research and Inventions charged with the function of coordinating all Naval research activities, and this office would be given statutory authority for its coordinating activities by a bill (H.R. 5911) introduced by Mr. Vinson and favorably reported out of the Committee on Naval Affairs on March 29, 1946.[5]

Among other things the Vinson bill provides for the establishment of a Naval Research Advisory Committee composed of competent civilian scientists, and for the negotiation of the type of contracts needed to enable the Navy to enlist the services of university and commercial laboratories.

No comparable legislation has been introduced to establish within the War Department a coordinating agency similar to that proposed for the Navy by the Vinson bill, but administrative steps have already been taken within the War Department to set up coordinating agencies both for the Ground Forces and the Air Forces. In particular, a new Research and Development Division of the Army General Staff is being organized which would have broad coordinating powers.

One of the major problems at the present time is to work out plans for effective coordination and unification of those research and development programs of the War and Navy Departments that are of joint interest. This problem is complicated by the merger fight now raging. Recently, however, there have been indications that the War and Navy Departments may be able to agree upon the establishment of a coordinating committee which would operate under the authority of the Secretaries of War and the Navy and would be given real authority to resolve disputes between the War and Navy Departments. If that is done, there is good assurance that War and Navy Departments will be able to establish a strong, unified, integrated and complete research and development program in the field of national defense.[6]

If the War Department and the Navy Department each gets its own scientific house in order, and if they take steps to work out a unified and coordinated program in fields of joint interest, it is difficult to imagine that ever again will we find ourselves in the 1939 situation when the War and Navy Departments were wasting part of the little money available to them by needless competing programs carried on under regulations prohibiting the exchange of information between the two departments. In order to carry insurance, however, it seems advisable to provide the two departments with a mechanism such as proposed in the National Science Foundation legislation whereby the Division of National Defense of the National Science Foundation, an agency independent of the War and Navy Departments, would be in a position to

[5]The Vinson Bill passed the Congress and was approved by the President on August 1, 1946, thereby becoming Public Law 588 of the 79th Congress.

[6]Those objectives have become the stated objectives in the charter for the Joint Research and Development Board, which was established on June 6, 1946 by the Secretaries of War and the Navy. Dr. Vannevar Bush is Chairman of the five-man Board, which has the authority to allocate responsibilities and resolve disputes among the Armed Services.

examine the research and development programs of the War and Navy Departments and take steps to fill in gaps that may appear. Furthermore, the establishment of such a Division of National Defense within the Foundation's structure would provide means whereby close correlation would be maintained between the scientific activities of the War and Navy Departments and the broader and more fundamental scientific activities of the Foundation.

Participation of Non-Governmental Organizations and Individuals

The above discussion clearly indicates that, even if only a small fraction of the proposed legislation is enacted, the Federal Government will participate in scientific activities in the post war era to an unprecedented degree. Thus it becomes important to consider ways and means whereby those scientific activities will be performed by the Government as efficiently and economically as possible and without disturbing unnecessarily the role of private organizations in our capitalistic system.

On the question of efficiency and economy, the experience of OSRD proves that the Government will be well advised to take advantage of the research and development facilities of our universities and commercial organizations, rather than attempt to operate Government laboratories staffed by Civil Service employees and subject to all the aplicable statutes and regulations. The National Science Foundation legislation accepts that reasoning and provides broad authorization for the negotiation of contracts with non-governmental organizations. The amended McMahon bill, on the other hand, provides the proposed Atomic Energy Commission with much more limited power to negotiate contracts and also provides for direct operation by the Commission of many facilities ,including research and development laboratories.

It would seem to be in the public interest and in the interest of commercial organizations to contract with these proposed governmental agencies to the maximum extent possible. In that way the governmental agencies will be able to have their research and development performed by the most competent organizations in the country, and on the other hand such commercial organizations will be in a position to be advised of the latest developments in fields of great importance to them.

Many research and development contracts executed by the Government agencies and commercial organizations raise no special problems, but in others controversial problems of importance are involved. This is particularly true of contractual arrangements under which there is a pooling of information among the commercial organizations, educational institutions

and Government research organizations engaged in the same program. Such a situation occurred during the war in the program sponsored by OSRD for the attempted synthesis of penicillin. In that program contractual arrangements were entered into by OSRD (I) with American commercial firms under which research work was performed and financed by the firms, (II) with American academic institutions and with governmental agencies under which work was performed and financed by OSRD, and (III) with the British Government under which there was an interchange of information between all American participants and all British participants performing work in the field. This complicated situation presented many unusual patent and anti-trust problems, and the OSRD contracts with American commercial organizations contained provisions designed to protect the equities of the American firms as well as the public interest.

In negotiating such contracts, for example, Dr. Bush made it clear to prospective contractors that the Government had no intention of going into the business of manufacturing synthetic penicillin, if and when it was developed, but was concerned only to the extent of seeing to it that adequate supplies would be made available at reasonable prices, which could include reasonable profits. This general proposition proved to be acceptable to the firms, and they entered into contracts under which the Director of OSRD was given the exclusive power to determine the disposition, as between the organizations which contributed information, of the title to and rights under patents covering inventions made during the course of the work. The participating firms are the best judges of whether or not that experiment was successful from their point of view, but the OSRD officials who were concerned with the arrangements are unanimous in thinking that the penicillin synthesis program has established a noteworthy precedent which may be used to advantage in defining relationships between the Government and commercial organizations in the post war era.

Participation in the scientific activities of Government agencies in the coming years should also take the form of individual relationships with Government agencies by persons in academic and commercial life. Nearly all of the pending legislation invites such relationships by establishing advisory committees and other means whereby the counsel of experts in civilian life may be made available in the work of the Government agencies. The National Science Foundation legislation, for example, not only establishes a National Science Board and divisional scientific committees to be composed for the most part of persons other than reg-

ular Government employees, but it also contains a provision protecting such persons while serving the Government in such capacities from criminal statutes that otherwise would be applicable. A similar provision is provided in the Vinson bill establishing an Office of Naval Research. The McMahon bill also would set up a "General Advisory Committee" to be composed of outstanding individuals from civilian life who would advise the Atomic Energy Commission on matters of broad policy, and also gives necessary protection to such individuals from certain criminal statutes that have been interpreted by the Attorney General to apply to individuals in similar situations serving the Government and retaining their normal commercial or academic positions.

Conclusion

It has been necessary to skip quickly many matters of great importance. I hope that I have made it quite clear, however, that these questions should not be taken lightly by organizations which are bound to have important relationships with the Government in future years. The point is that the Government will need the assistance of many private organizations, and those organizations will need the assistance of the Government, if we are to make a worthwhile effort to resolve the complex national economic, social and political issues raised by the war and recent scientific advances.

McLachlan Receives Legion of Merit Medal

Lt. Col. Robert W. McLachlan, F.A.I.C., associate professor of science at New Jersey State College, Upper Montclair, N. J., has been awarded the Legion of Merit Medal for outstanding military service. The citation credits him with exceptional services in the development of superior coolants and the elimination of corrosion difficulties in liquid cooled engines. From April 1942 to September 1946, Colonel McLachlan served as chief of the Coolants and Special Projects Unit, Materiels Laboratory, Air Materiel Command Engineering Division, Wright Field, Ohio. While stationed at Wright Field, Colonel McLachlan was active in the Miami Valley Chapter, A.I.C., and was elected as its treasurer. He represented the American Chemical Society, Dayton Section, as alternate to the Ohio C_2P_2.

General Mills' first soybean oil refining unit began operation in September at Belmond, Iowa. The unit, which removes lecithin from crude soybean oil, is under the operation of the Chemical Division, headed by Whitney H. Eastman, president.

Dr. Gustav Egloff, F.A.I.C., spoke, September 10th, before a meeting of Alpha Chi Sigma in Chicago, on "Some Scientific, Technical and Educational Impressions of China".

From Our Readers

Chemists Salaries in the Federal Service

I have enjoyed reading THE CHEMIST from month to month and learning what's what in the chemical world.

There is one subject that has not been given detailed treatment, however, and that is salaries of chemists in Government service. The Washington Chapter looked into this matter about twenty years ago and again during the year just passed. I feel that publicity should be given to this problem confronting the chemist in Government and the project pursued energetically by the INSTITUTE. It is a timely topic.

In these days of rapidly spiraling living costs, chemists in Government service find it increasingly difficult to get along on their meager salaries and of necessity turn to commercial fields for their livelihood. As a consequence our Federal professional Bureaus and Offices are losing more and more men to commerce and industry.

The short sighted policy of Congress in not raising the ceiling of salaries in the classified civil service sufficiently is largely responsible for this exodus and if not corrected will seriously injure the work of the agencies. I feel that $25,000 would be a fair ceiling.

Through my participation during recent years in interdepartmental committee activities, I am familiar with the chemical work carried on by the various Government agencies and through many years of service in the United States Department of Commerce, I am thoroughly conversant with the chemical activities of its offices.

As I write, I have before me two Commerce Department's monthly industry reports, "Chemicals and Allied Products" and "Drugs and Pharmaceuticals". Mr. C. C. Concannon, F.A.I.C., is responsible for one and Mr. T. W. Delahanty for the other. Both reports are remarkable for their coverage and thoroughness and no business man or industrialist can afford to be without them. This observation applies also to the many synopses of information covering chemicals and allied commodities as well as numerous special circulars, trade promotion bulletins, and other chemical brochures. These valuable services should by all means be maintained at their present high standards.

A higher salary ceiling for our scientific and professional chiefs in the classified service and for their loyal and efficient staffs will safeguard the continuance of the many services that they render the American business man.

—*J. N. Taylor, F.A.I.C.*

Professional Articles to be Reprinted

This Institute is planning an educational program dealing with the licensing of professional chemists, to be conducted during the year 1946-47. It would be greatly appreciated if you would allow us to reprint all or selected parts of the following articles in THE CHEMIST for distribution to our membership: "What Licensing Has Done and is Doing for Engineers and Professional Men" by H. E. Nold; "What Licensing Could Do for the Chemist", by John D. Coleman; "The Licensing of Professional Men" by H. A. Wagner, and "What Licensing Would Do for the Chemist" by H. T. Jones, F.A.I.C. —*The Chemical Institute of Canada.*

Poison Valley, Java

The following footnote from Chapter I, entitled "The Air We Breathe", from *The Chemistry of Common Life,* by James F. Johnston, D. Appleton and Company, 1855, may be of interest to your readers:

"The most remarkable natural example of an atmosphere overloaded with carbonic acid gas is the famous Poison Valley in the island of Java, which is thus described by an eye-witness:

"'We took with us two dogs and some fowls to try experiments in this poisonous hollow. On arriving at the foot of the mountain we dismounted and scrambled up the side about a quarter of a mile holding on by the branches of the trees. When within a few yards of the valley we experienced a strong nauseous suffocating smell, but on coming close to the edge this disagreeable odour left us. The valley appeared to be about half a mile in circumference, oval, and the depth from thirty to thirty-five feet; the bottom quite flat; no vegetation; strewed with some very large (apparently) river stones; and the whole covered with skeletons of human beings, tigers, pigs, deer, peacocks, and all sorts of birds. We could not perceive any vapour or any opening in the ground, which last appeared to us to be of hard sandy substance. It was now proposed by one of the party to enter the valley; but at the spot where we were this was difficult at least for me, as one false step would have brought us to eternity, seeing no assistance could be given. We lighted our cigars, and, with the assistance of a bamboo, we went down within eighteen feet of the bottom. Here we did not experience any difficulty in breathing, but an offensive nauseous smell annoyed us. We now fastened a dog to the end of a bamboo eighteen feet long, and sent him in: we had our watches in our hands, and in fourteen seconds he fell on his back, did not move his limbs or look round, but continued to breathe eighteen minutes. We then sent in another, or rather he got

loose, and walked to where the other dog was lying. He then stood quite still, and in ten minutes fell on his face, and never afterwards moved his limbs: he continued to breathe seven minutes. We now tried a fowl, which died in a minute and a half. We threw in another, which died before touching the ground. During these experiments we experienced a heavy shower of rain; but we were so interested by the awful sight before us that we did not care for getting wet. On the opposite side, near a large stone, was the skeleton of a human being, who must have perished on his back, with his hand under his head. From being exposed to the weather, the bones were bleached as white as ivory. I was anxious to procure this skeleton, but any attempt to get it would have been madness.' "

—Benjamin Mark Levy, A.A.I.C.

Suggests Summaries of Current Literature

Have two or three short feature articles dealing with the policies of the Institute—the professional status of chemists. Reprint in condensed form the leading articles of various trade journals and societies. With the type of membership in the Institute, it would be a simple matter to get two or three experts in each field to summarize the highlights of the month in that field. In fact, if only a fraction of a per cent of your membership would submit such digests each month, you would still have summaries of journal articles covering more than twenty subjects.

—T. S. McCarthy.

Request to Reprint

In the April, 1946, issue of THE CHEMIST, you printed an abstract of a talk, "Possibilities of Future Technologic Development", by Mr. Watson Davis.

Since Professor Robert Zetler and I are preparing a textbook on English for engineers, we wonder whether we may have permission to reproduce this abstract as an example of a scientific speech.

—W. George Crouch,
Associate professor of English
The University of Pittsburgh.

Finds THE CHEMIST of Professional Value

Your periodical, THE CHEMIST, is an excellent source of material of general professional interest. Several subscriptions are being requested by separate correspondence. We are ordering reprints of "The Employed Chemist and His Employer" for distribution to our membership.

—Engineers Association of the Material Laboratory.

Interchemical Review in its September issue, features "High-speed Sectioning in Electron Microscopy", and "What a Research Library Offers."

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November Meeting

The 231st meeting of the National Council of The American Institute of Chemists was held November 7, 1946, at 6:00 p.m., at The Chemists' Club, 52 East 41st St., New York, N. Y., with Dr. Foster D. Snell, President, presiding. The following officers and councilors were present:

Messrs: E. Farber, H. L. Fisher, L. H. Flett, J. W. E. Harrisson, F. A. Hessel, D. B. Keyes, R. E. Kirk, J. M. McIlvain, H. S. Neiman, N.

A. Shepard, F. D. Snell, and L. Van Doren. Miss V. F. Kimball was present.

The minutes of the preceding regular council meeting were accepted.

The treasurer's report was accepted.

A letter from Mr. Howard S. Neiman was read, concerning the procedure necessary for amending the present constitution of the INSTITUTE.

A letter from the National Society for Medical Research was presented, requesting that the INSTITUTE join this society for the purpose of assisting it in informing the public regarding the necessity, the human character, and the accomplishments of animal experimentation. After discussion, and upon motion made, seconded, and carried, it was decided that a committee should be appointed to take action to investigate this matter further.

The president appointed Mr. Flett as chairman of this committee, and as members, Dr. Donald B. Keyes, Dr. C. A. Johnson, and Dr. Randolph Major, with the appointment of the fifth member of the committee to be left to the discretion of the chairman of the committee.

The inquiry from a veteran regarding the possible investment of a four-figure sum in a chemical business, or to start a chemical business of his own, was officially laid on the table, after agreement that individual members might give the young man personal advice if they so desired. It was also suggested that he invest this money in his own education.

The president of the INSTITUTE reported in regard to certain matters which had received his attention.

The Committee on Requirements for Admission presented certain recommendations, and was asked to hold these until a later meeting of the Council. The president also appointed this same committee as a committee to propose a modified set of by-laws for the INSTITUTE, to be presented at a later meeting.

After discussion of a possible change in the annual meeting date to the latter part of April, it was decided to refer this matter to the next meeting of the Council.

It was suggested that the jury on the medal award should hold its meeting early in December.

Upon motion made, seconded and carried, the requests of Dr. David G. Jacobus and Mr. William R. Prosser for reinstatement as fellow members of THE INSTITUTE were approved, and they were so reinstated.

Upon motion made, seconded and carried, the following members were elected:

Fellows

Appleton, Martin D.
Senior research chemist, Nuodex Products Co., Inc., 830 Magnolia

Avenue, Elizabeth, N. J.

Bebee, Francis H.
Assistant secretary, Interchemical Corporation and Administrative assistant to vice president and director of research, The Research Laboratories, 432 W. 45th St., New York 19, N. Y.

Culver, Martin Joseph
Project leader, Publicker Industries, Inc., Mifflin and Swanson Sts., Philadelphia 48, Penna.

Frey, Albert Jean
Vice president in charge of production, Hoffman La Roche, Inc., Nutley, N. J.

Pfeifer, C. William
Head, High Polymer Laboratory, Publicker Industries, Inc., 1429 Walnut Street, Philadelphia, Pa.

Pizzarello, Roy A.
Research chemist, Interchemical Corporation, 432 W. 45th Street, New York, N. Y.

Stanton, William A.
Group leader, Research Division, Photo Products Department, E. I. duPont de Nemours & Co., Inc., Parlin, N. J.

Sullivan, Francis M.
Chemist, Hoffmann-LaRoche, Inc., Nutley, N. J.

Uhl, Herbert B.
Assistant research supervisor, Heyden Chemical Corporation, River Drive, Garfield, N. J.

Witschonke, Charles R.
Research chemist, Calco Chemical Division, Bound Brook, N. J.

Zucker, Milton
Research manager, International Printing Ink Division, Interchemical Corporation, 432 W. 45th St., New York 19, N. Y.

Members

D'Andrea, Dominick
Chemist, Fleischmann Laboratories, 810 Grand Concourse, New York, N. Y.

Hammer, Irving Peter
Research chemist, Ellis Foster Co., Montclair, N. J.

Associates

Reich, Leo
Analytical and control chemist, Glyco Products Co., Inc., 230 King Street, Brooklyn, N. Y.

Raised from Associate to Member

Bachsetter, Leo S.
Plant chief chemist, Kirkman Division of Colgate-Palmolive Peet Co., 215 Water Street, Brooklyn, N. Y.

There being no further business, adjournment was taken.

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GLYCERIN, ITS INDUSTRIAL AND COMMERCIAL APPLICATIONS. By Georgia Leffingwell, Ph.D. and M. A. Lesser, B.Sc. *Chemical Publishing Company*. 302 pp. 5½" x 8½". $5.00

Both authors have published a large number of articles in various trade and technical publications on this subject. They were urged by a number of people, including Walter J. Murphy, F.A.I.C., who wrote the foreword, to publish a practical treatise on the industrial and commercial applications of glycerin. They have achieved this in a readable volume, divided into the following chapters: Brief History of Glycerin, Adhesives and Cements, Cleaners and Polishes, Electrical Equipment, Explosives, Leather, Lubricants, Metals, Packaging Materials, Paper, Photography, Plastics, Printing and Lithography, Paints and Protective Coatings, Rubber, Textiles and Dyes, Tobacco, Glass, Agriculture, Cosmetics, Beverages, Foods, Medicine and Surgery, Orthodontia and Dentistry, Pharmaceuticals, Veterinary Medicine, Optometry, Glycerin Derivatives, and a list of 1583 Glycerin uses.

Each chapter contains an excellent group of references, including patent references where patented uses are mentioned in the chapter. A number of formulas are included as examples to illustrate various statements concerning a specific use of glycerin.

The chapter on Glycerin Derivatives was prepared by H. Bennett, F.A.I.C., and includes structural formulas. The appendix gives the properties of glycerin. The book is fully indexed.

The average reader will be surprised at the number of materials in which glycerin is incorporated. Moreover, he will probably find a new and successful use for it in his own field.

ORGANIC CHEMISTRY. By Paul Karrer. Translated by A. J. Mee, M.A., B.Sc. Second English edition, *Elsevier Publishing Co., Inc.*, 1946. 953 pp. Price $7.50.

This book is a revision of the first English edition published in 1938, and is based on the eighth German edition of Karrer's well-known "Lehrbuch der Organischen Chemie." This edition is once again almost completely descriptive in nature and maintains its objective of providing the student with a good general survey of organic chemistry.

Although the additions to this edition are not too extensive, sufficient new material has been added to increase the text by some fifty pages. Emphasis is once again placed on the chemistry of naturally occurring products and biochemical topics. This edition differs from the previous one, however, in placing more emphasis on the electronic interpretation of reaction mechanisms.

The decreased price of the book increases its possibility for use as a text

for an advanced survey course in organic chemistry. In any event, it should serve admirably as a reliable source of reference for graduate students and industrial chemists.

—*John B. Rust, F.A.I.C.*

NUCELONICS. What Everybody Should Know About Atomic Physics. A Handbook on the Structure of Matter, Structure of the Atom, Nuclear Structure, Nuclear Transformation, High Energy Particles, Fission of Uranium, Neutron Reactions, Peacetime Applications. Based on official material prepared under the auspices of the U. S. Navy Department. Progress Press, 1946. 38 pp. with 46 figures and 4 tables. 8½" x 11", (3 cols. condensed type.) Paper bound. $1.00.

This Manual is a resume of the foreshortened fundamentals of molecular and ionic motion, of radioactivity, and of the effects of the bombardment of atoms or nuclei of atoms with nuclear particles. The presentation is orderly, simple, and elementary with an undercurrent of chemical thought throughout. The illustrations are diagrammatic, easy to scan and to the point.

Wherever possible comparisons are drawn between chemical reactions (of molecular and atomic dimensions) and nuclear reactions (of nuclear particle dimensions), such as, activation energy, thermal effects, velocity of motion, mean free paths, velocity of reaction and the dynamics of explosions. The differences are chiefly those of dimension:

	Nuclear reactions	**Molecular-atomic reactions**
Activation Energy		
calories	tens of thousands	millions
electron-volts	3 (TNT)	less than 5×10^6 ($Uranium^{235}$)
Thermal effects		
calories	tens of thousands	billions
electron-volts	10 (TNT)	more than 200×10^6 ($Uranium^{235}$)
Linear velocity of particles	$184{,}000\sqrt{\frac{2.016}{\text{mol. wt.}}}$ Cm/sec	$0.03\text{-}0.3 \times 10^{10}$cm/sec (natural alpha) $0.9 \times 3 \times 10^{10}$cm/sec (accelerated) 184,000 cm/sec (slowed neutrons)

Extending the comparison to the mean free paths of particles, we find 10^{-5}cm for gas molecules as against 10 cm for neutrons in an uranium pile. The opposing forces of nuclear fusion and nuclear fission are discussed. The theoretical tendencies of lighter nuclei to fusion is likened to surface tension effects, while the fission instability is due to coulomb forces of electrostatic repulsion in overcrowded nuclei. The overcrowding is expressed by the *packing fraction*:

$$\frac{(\text{atomic weight}-\text{mass number}) \times 10{,}000}{\text{mass number}}$$

Nuclear instability increases with the numerical value of the packing fraction. Activation energy, fusion and fission instability, relation of packing fraction to mass number and Maxwell distribution curves of activation energy are adequately diagrammed. The better known types of nuclear rearrangement are discussed in detail and then tabulated, according to the nature of the projectile and of the emitted particles. The devices for determining and recording hits on nuclear targets are described and illustrated; likewise the machines for accelerating charged particles. In discussing the release of enormous quantities of energy from nuclear rearrangements, the correspondingly high activation energies are cited. Thus, the hydrogen-helium conversion in the sun does not take place directly but goes in step-like manner over unstable isotopes of carbon and nitrogen and requires a temperature of 20,000,000 degrees for its maintenance.

Methods of separating the isotopes of uranium, of construction of uranium-graphite piles, of manufacture and recovery of the new fissionable element Plutonium, as well as the methods of slowing down neutrons from 1/20 of the velocity of light to the thermal velocities of gas molecules at the same temperature, are described.

The concept of barrier energy and barrier leakage by resonance is discussed and diagrammed. The assembly and detonation of an atomic bomb is described and illustrated. In connection with peacetime application of atomic energy for power generation, it is pointed out that the advantage of obtaining large quantities of energy from small masses of atomic fuel is largely offset by the "cost of uranium ($10,000 to $35,000 per lb.)", by the excess in the amount of shielding necessary to protect personnel (heavy concrete walls, etxensive instrumentation for automatic and remote controls), and by the difficulty in obtaining construction materials to withstand the high temperatures and the deteriorating influences of the radiation products coincidental with the energy-producing reactions.

Some by-products of the operations of the Manhattan District are thirty

radioactive isotopes from the uranium piles at the Hanford Plant alone; application of mass spectroscope to the qualitative and quantitative analysis of petroleum products; and the use of the same type of porous barrier to separate helium from natural gas as was used in the separation of U^{235} from U^{238}.

It should be of lasting interest to chemists to know that the atom bomb was made possible by the work of a chemist in discovering that uranium was fissionable by neutrons and that the identification of the fission products was made by chemical means (Otto Hahn, 1939).

Unfortunately, *Nucleonics* is copiously sprinkled with typographical errors, some of which are trivial and do not distract from the meaning of the text, while others are more serious and quite annoying. Instead of using one system of units throughout, with equivalents in parentheses where necessary, teaspoons, grams, pounds, centimeters, feet, miles, B.T.U., calories, ergs, Kw. hr., and MEV are used quite promiscuously Chemists will be surprised to learn that a *mole* may be either a gram-molecular weight or a gram-atomic weight, and that 2 moles of hydrogen plus one mole of oxygen atoms form *one mole* of water. Numerical values for mass numbers (A) are called atomic weights until the section on the *packing fraction* is reached, where the definition of packing fraction depends basically on the difference between atomic weight and mass number. The statement on page 4, "The formation of one *mole* of hydrogen atoms, or a half mole of hydrogen molecules, requires a unit of electricity known as the *faraday*, which is 96,500 coulombs" is fundamentally wrong.

Reference to the tables by pages is misleading; the table of equivalents is to be found on page 36, not page 50, and the Summary of Reaction Types is on page 17, instead of page 31 as stated in the text. The table of equivalents is poorly arranged, and there is a glaring error in the little table of Important Constants (p. 35); electron charge is given as

"4.8029×10^{-10} coulomb",

which should read 1.60×10^{-19} coulomb (or 4.80×10^{-10} esu = *electrostatic units*).

The hydrogen to helium conversion has been given as an example, for many years, of the tremendous amount of energy locked up in the atom's nucleus, and the change in mass per molecule of helium (a monatomic gas) is invariably given as 0.03 grams, and in more up-to-date units as 0.03 mass units per helium nucleus. Due to a typographical error of alinement on page 14, a remarkable result of 0.023134 *grams per mass loss of reaction is obtained.* Correcting the error in alinement, the result of 0.03134 grams is obtained. The difference between the latter result and the usual 0.03 grams is occasioned

by the use of different values for the masses of protons, neutrons and helium nuclei from those given in the *Smyth Report on Atomic Energy* and in other authoritative sources.

In spite of the numerous errors, the subject matter and the development of the subject are well done, especially for beginners, and those who did not get the full purport of the Smyth document on first reading will get more out of it on second reading, if they also read *Nucleonics* in between.

—*E. E. Butterfield, F.A.I.C.*

Recommended for Professional Reading

"Human Relations in Research Institution Management", by William A. Hamor, F.A.I.C., assistant director, Mellon Institute. *Advanced Management*, quarterly journal of the Society for the Advancement of Management, 84 William Street, New York 7, N. Y., December 1946 issue. A discussion of management procedures which will be of value to research directors and chemists who intend to become research directors.

Dr. W. R. Whitney, Director of General Electric Company's Research Laboratory, recommends that every researcher read "The New Atlantis" by Francis Bacon (circa 1600 A.D.), because "it foreshadows most of the valuable discoveries which the years have now exposed."

Dr. Gustav Egloff, F.A.I.C., recommends for professional reading the following articles:

"Science Legislation — Obituary: National Science Foundation 1946", by Howard A. Meyerhoff, *Science*, August 2, 1946. "Only in a reasonable show of unity, achieved by some compromise, can scientists expect political results."

"Why Every Engineer Should Register", by B. F. Friberg, associate American Society of Civil Engineers. From "The Why and How of Registration for Professional Engineers" by Otto S. Reynolds, Missouri Society of Professional Engineers. "If it is your privilege, it your duty to register."

"Should Chemists Be Licensed? Yes. Rebuttal", by Gustav Egloff, F.A.I.C., *Chemical and Engineering News*, September 10, 1946. "We are hopeful that the discussions pro and con will be helpful in formulating an 'ideal licensing act'. The Professional Status Committee of the American Chemical Society, Chicago Section, is working on such an act."

"Collective Bargaining for Engineers", by Waldo E. Fisher, professor of industrial relations; research associate, Industrial Research Department Wharton School of Finance and Commerce, University of Pennsylvania. *Engineering and Science Monthly*, June 1946.

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The younger generation may see the time when a nation's wealth will be measured not by the extent of her natural resources, but by the number of her scientists and research laboratories. The future of mankind rests with science.

—*Dr. Joseph L. Rosin, F.A.I.C.*

Chemical Condensates

Ed. F. Degering, F.A.I.C.

"Science has conquered hunger, but statesmanship has not. Statesmanship has not addressed itself to this more basic fundamental of human happiness. If the governments of the world were to devote themselves half as eagerly to fighting hunger as to fighting their national rivals, they too could conquer hunger . . . In the vegetable kingdom, only now beginning to be unlocked, is plenty for all the earth's 2,000,000,000 people."
—*Wheeler McMillen, President National Farm Chemurgic Council.*

Levulose is now produced, on a pilot plant scale, by an ion-exchange process.

About four thousand scientists, according to a release from the War Department, were engaged in extensive preparations to combat and undertake biological warfare.

The 1946 production of goods by the rubber industry is expected to reach a value of $1,500,000,000 as compared to $900,000,000 in 1939.

The application of knowledge acquired in 1946 in the nation's great aeronautical laboratories, according to Dr. Warner on CBS, in "Adventures in Science", will effect an annual saving of $10,000,000 or more in airline operation costs.

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A.I.C. Council Meetings

Meetings of the National Council of THE AMERICAN INSTITUTE OF CHEMISTS are held on the third Tuesday of each month, at six o'clock p.m. in The Chemists' Club, 52 East 41st Street, New York, N. Y. Dates for the current season are:

December 17, 1946
January 21, 1947
February 18, 1947
March 18, 1947
April 15, 1947
May (Annual Meeting)
June 17, 1947

Meeting Dates

DEC. 4—Dinner Meeting, Niagara Chapter, A.I.C. Speaker, Dr. Foster D. Snell, president A.I.C., "Chemistry—a Profession."

DEC. 5th — Pennsylvania Chapter, A.I.C., Engineers' Club, 1317 Spruce St., Philadelphia, Dr. Lloyd Van Doren, secretary, The American Institute of Chemists, "Patents".

DEC. 6th—Miami Valley Chapter, A.I.C., Engineers' Club, Dayton, Ohio. Joint meeting with American Chemical Society and University of Chicago Alumni Association. Speaker, Dr. Anton J. Carlson, F.A.I.C., professor emeritus, University of Chicago. "The Science of Biology and the Future of Man."

DEC. 9th — New Jersey Chapter, A.I.C., Public Service Auditorium, 80 Park Place, Newark, N. J. Speakers: Dr. Foster D. Snell, "Chemistry, a Profession," and Dr. Alden H. Emery, Secretary, American Chemical Society, "What's Ahead for the American Chemical Society."

DEC. 21st—Meeting Virginia Blue Ridge Section, American Chemical Society, Andrew Lewis High School Auditorium, Salem, Virginia. Speaker, Dr. Milton Burton, F.A.I.C. "Atomic Energy and Radiation Chemistry." A.I.C. members are invited to attend.

Dr. Frederick A. Hessel, treasurer A.I.C., is flying to Europe for the second time in the past six months to transact business in Belgium and France. He expects to return about the middle of December.

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Standard Oil Development Staff Increased

Robert P. Russell, president of Standard Oil Development Company, speaking over ABC network recently, revealed that the research staff of his company has increased from 458 men and women in 1936 to 1,900 at present. Further increases are expected when necessary facilities and personnel are available. He stated that his company plans to stimulate scientific education by setting up additional scholarships and fellowships and by increasing research grants to universities. Mr. Russell received the gold medal of THE AMERICAN INSTITUTE OF CHEMISTS in 1946.

Gustav Egloff, F.A.I.C., was the guest of honor at a luncheon given by the Institute of Petroleum in London in August. During the informal discussion, Dr. Egloff asserted that "Our raw material, petroleum, is becoming the medium of a chemical industry at an increasingly fast rate, but our great problem is where are the research workers coming from? We in the U. S., through the effects of war, are terribly shorthanded in this direction."

Dr. Alexander Silverman, F.A.I.C., head of the Chemistry Department, University of Pittsburgh, addressed the October 22nd meeting of the American Pharmaceutical Association in Pittsburgh, on "Glass Today and Tomorrow".

—Ewing-Galloway

Faith in the Future

May Christmas bring you Faith, and Hope and Cheer!
The solstice passes, and the sun returns.
Happy and bright may be the coming Year,
With Peace and Love for which the Spirit yearns.

Steadfast, the Sphinx stares toward the sullen East,
Firm in the faith new dawn the sun will bring.
Let us greet then, with wassail and with feast,
The ever-lengthening days that augur Spring.

—Jerome Alexander, F.A.I.C.

The first National Materials Handling Exposition will be held January 14-17, 1947, at the Public Auditorium, Cleveland, Ohio. It will be devoted to materials handling equipment and techniques.

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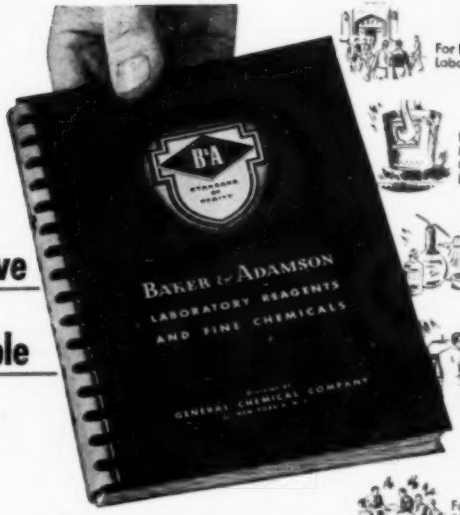

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